NEW ENGLAND NOTES

THE PROVINCELANDS GOLDEN CLUBS

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The Golden Club (*Orontium aquaticum, Araceae*) is endemic to eastern North America and is at the northern limit of its range in Massachusetts (Britton, 1913; Fernald, 1950). This species is recognized as declining in abundance in Massachusetts and is considered to be endangered (Coddington & Field, 1978). There are but three extant stations for this species in the state, in contrast to ten known localities in the past (*ibid.*). The decline in abundance has been attributed to loss of habitat (*ibid.*).

The Golden Club ranges south from Massachusetts and New York to Florida, and west to Louisiana and Kentucky (Britton, 1913; Fernald, 1950). It prefers sandy, muddy or peaty shores and shallow water, bogs, and marshes (*ibid.*). The plant is a perennial, blooming in April and May (*ibid.*). The flowering stalk is the most distinctive feature of this beautiful aquatic plant, a white-stemmed, golden-tipped spear emerging a half-foot or more from the water's surface. A typical Golden Club plant will send up, radially, eight or more of these stalks.

Little is known of the natural history of this species, a deficiency noted by more than one of the authors cited. As example, a search of the literature uncovered only one reference to reproduction: "It is easily propagated by division of the rhizomes" (Raffill, 1946). Similarly, references to the ecology of the species are scarce.

OCCURENCE OBSERVATIONS IN THE PROVINCELANDS

Historically, Barnstable County Golden Club populations have been recorded in Truro (1890) and Yarmouth (1925) as well as in the Provincelands (1904, 1912, 1933) (New England Botanical Club Herbarium specimens). The Provincelands apparently contains the only surviving Cape Cod population. Murdoch, in his 1914 report on the Provincelands Golden Clubs in *Rhodora,* says "In four out of the six or seven ponds seen by the writer, *Orontium* is very abundant. Up to the middle of June it is the only conspicuous aquatic in these ponds." Hinds and Hathaway (1968) note that

"Several ponds in the Province Lands have quantities of this unusual plant."

This writer, after observing all of the more than thirty fresh water ponds in the Provincelands in 1980 and 1981, has identified eight separate Golden Club colonies. Five of the eight sites contained greater than one hundred individuals. In the three ponds with fewer numbers, one contained eleven individuals, another contained two, and the third, one. The ponds with populations of eleven and one are isolated from obvious human activity. The small population sizes may be due to such factors as water quality or age of the population. The pond with two specimens is discussed under "Threat Observations."

The predominant habitat of the Provincelands populations is shallow water with several inches of mud covering a sandy bottom. Although Golden Club is virtually the only aquatic in its immediate habitat during flowering (White Water-lily, *Nymphaea odorata,* emerges during the later stages in May), swamp and shoreline shrub communities and grass and cattail marshes grow in adjacent habitats. The Golden Club frequently intermingles at the border.

Only a few Golden Club plants were found growing away from standing water. However, in one area it is established forty feet from a pond on damp, needle-strewn soil in a Pitch Pine (*Pinus rigida*) woodland.

Following flowering, the Golden Club stalk begins to arch over until the inflorescence is completely under water during fruit production. Although this arching also occurred with Golden Clubs growing on land, such a reorientation of the inflorescence is probably related to the water, where the vast majority of the individuals grow. The water may afford protection for the developing seed, or contribute to successful seed dispersal. Consequently, water levels in these ponds may be critical for the preservation of the populations.

THREAT OBSERVATIONS

With one exception, all of the Golden Club populations occur wholely within the Cape Cod National Seashore boundary. One population is shared by the National Seashore and the municipality of Provincetown (the municipal portion is owned by the Massachusetts Division of Fisheries and Wildlife). The National Park Service has developed and maintained a variety of accesses and conveni-

ences for visitors to the Provincelands. These developments provide easy access to virtually every Golden Club colony. In spite of this access, human visitation has not obviously impacted any of the Golden Club populations. Individuals thrive at several access points, and fishermen were observed wading among the Golden Club plants in one pond. These access points lead off of developed trails, but are not in general part of the Park Service trail system, and are probably used by fishermen and hunters.

The greatest threat to Golden Club appears to be occurring in the pond adjacent to the Town of Provincetown municipal landfill (a dump until 1974) on land leased from the Park Service. The shore is a thick layer of mud and the surface of the pond is dark green with algae. The two Golden Club specimens in this pond produced only a few, undersized flowering stalks, and each withered before fruiting. The leaves did not develop above water on either plant, and by the end of May the plants had virtually disappeared from sight. These observations suggest this is a population in decline.

During April and the first week in May, the Golden Club populations were observed to be browsed by mature Canadian Geese (*Branta canadensis*). During this time, the shoreline was littered with Golden Club debris. No plant was observed to have lost all of its leafy shoots or flowering stalks, but the recovery of the affected plants was not monitored. The browsing was observed to cease after inflorescence maturation.

Fernald and Kinsey (1958) quote 18th century Swedish botanist Pehr Kalm as saying "the cattle, hogs and stags, are very fond of the leaves in spring." American Indians ate the roots and seeds, and called the plant *Tawkee* and *Tuckahoe* (*Ibid.;* Harris, 1968; Medsger, 1939). Wilson (1960) says "The *Araceae* as a group are notable for the occurrence of needle-like crystals of calcium oxalate (raphides) in 'packets' which occur in small capsules in almost all tissues. These account for the immunity of most *Araceae* to herbivorous mammals." It is possible these crystals develop in the Golden Club as the plant matures, thus allowing browsing during the early stages.

CONCLUSIONS

We do not know at present whether the Provincelands Golden Club populations are increasing, stable, or declining. There is evidence of at least minor habitat loss. Most existing populations

appear healthy and, by Massachusetts Golden Club standards, abundant. A detailed population survey is needed to monitor the health of the station.

The lack of biological and morphological data, especially regarding reproduction and dispersal, should be a major concern. Habitat needs, nutrient requirements, interaction between populations, pollinators, genetic variability, rhizome growth, and seed dispersal are all essential knowledge for successful management of these populations.

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